alloys of various metals, using equivalent proportions, and determined their conducting powers. The general result obtained is, that alloys may be classed under the three following heads :—

1st. Alloys which conduct heat in ratio with the relative equivalents of the metals composing them.

2nd. Alloys in which there is an excess of equivalents of the worse conducting metal over the number of equivalents of the better conductor, such as alloys composed of 1Cu and 2Sn ; 1Cu and 3Sn ; 1Cu and 4Sn, &c., and which present the curious and unexpected result that they conduct heat as if they did not contain a particle of the better conductor ; the conducting power of such alloys being the same as if the square bar which was used in the experiments were entirely composed of the worse conducting metal.

3rd. Alloys composed of the same metals as the last class, but in which the number of equivalents of the better conducting metal is greater than the number of equivalents of the worse conductor ; for example, alloys composed of 1Sn 2Cu ; 1Sn 3Cu ; 1Sn 4Cu, &c. ; in this case each alloy has its own arbitrary conducting power, and the conductibility of such an alloy gradually increases and tends towards the conducting power of the better conductor of the two metals composing the alloy.

Experiments were also made with bars composed of various metals soldered together, in order to compare the results obtained with alloys with those afforded by the same metals when mixed.

The first part of the paper concludes with the conducting power of several commercial brass alloys.

The second part, which will shortly be published, will contain the conduction of heat by amalgams.

II. "On the Surface which is the Envelope of Planes through the Points of an Ellipsoid at right angles to the Radius Vectors from the Centre." By ARTHUR CAYLEY, Esq., F.R.S. Received February 22, 1858.

(Abstract.)

The consideration of the surface in question was suggested to me some years ago by Professor Stokes ; but it is proper to remark, that the curve which is the envelope of lines through the points of an

ellipse at right angles to the radius vectors through the centre occurs incidentally in Tortolini's memoir "Sulle relazione," &c., Tortolini, vol. vi. pp. 433 to 466 (1855), see p. 461, where the equation is found to be

$$\{4(a^4+b^4-a^2b^2)-3(a^2x^2+b^2y^2)\}^3$$
$$=\{9a^2(2b^2-a^2)x^2+9b^2(2a^2-b^2)y^2-4(a^2+b^2)(2a^2-b^2)(2b^2-a^2)\}^2,$$

an equation which is obtained by equating to zero the discriminant of a *quartic* function. Tortolini remarks that this equation was first obtained by him in 1846 in the 'Raccolta Scientifica di Roma,' and he notices that the curve is known under the name of Talbot's curve.

According to my method, the equation of the curve is obtained by equating to zero the discriminant of a cubic function, and the equation of the surface is obtained by equating to zero the discriminant of a quartic function.

The paper contains a preparatory discussion of the curve, and the surface is then discussed in a similar manner, viz. by means of the equations

$$x=\mathrm{X}\left\{2-\frac{1}{a^2}(\mathrm{X}^2+\mathrm{Y}^2+\mathrm{Z}^2)\right\},$$
$$y=\mathrm{Y}\left\{2-\frac{1}{b^2}(\mathrm{X}^2+\mathrm{Y}^2+\mathrm{Z}^2)\right\},$$
$$z=\mathrm{Z}\left\{2-\frac{1}{c^2}(\mathrm{X}^2+\mathrm{Y}^2+\mathrm{Z}^2)\right\},$$

which determine the coordinates x, y, z of a point on the surface in terms of X, Y, Z, the coordinates of a point on the ellipsoid. The surface, which is one of the tenth order, is found to have nodal conics in each of the principal planes, and also a cuspidal curve. The case more particularly considered is that for which $a^2>2b^2$, $b^2>2c^2$, and $a^2+c^2>3b^2$, and the memoir contains a figure showing the form of the surface for the case in question. The equation of the surface is obtained by the elimination of X, Y, Z between the above-mentioned equations and the equation $\frac{\mathrm{X}^2}{a^2}+\frac{\mathrm{Y}^2}{b^2}+\frac{\mathrm{Z}^2}{c^2}=1$, as already remarked. This is reduced to the determination of the discriminant of a quartic function, and the equation of the surface is thus obtained under the form $\mathrm{I}^3-27\mathrm{J}^2=0$, where I and J are given functions of the coordinates.